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Project Number G5012-2909WJ

Internal Distribution
Project Records (2)
BMI-ES&H RP Files

Date June 26, 2000

To J. Poliziani

From G. Kirsch

Subject Historical Information for Building JN-1

DESCRIPTION

The original section of Building JN-1, referred to as JN-1A since 1973, was constructed in 1955 at approximately the same time when buildings JN-2 and JN-3 were built. JN-1A is a steel frame and concrete block building with a brick exterior. JN-1A contained offices, lab space, hot cells, and subterranean alpha-gamma cells. In 1973, JN-1B was added as a high-bay, steel-frame structure with metal panel walls. This latter facility housed a large hot cell, adjacent fuel storage pool and truck bay designed to off-load casks containing irradiated fuel assemblies into the pool for subsequent transfer underwater into the cell. Currently, the JN-1A and B facility is used for assembling, categorizing, and packaging TRU and non-TRU waste. In addition, the building currently provides limited office and support space for the D&D operations.

PAST RADIOLOGICAL OPERATIONS

The facility was constructed for destructive and non-destructive examination of irradiated reactor fuel, cladding materials and associated reactor components. Experimental programs included research in support of fuel development for the AEC, successor agencies, and the commercial nuclear power industry. High levels of high-specific-activity radioactive materials were utilized in research operations. These materials left a significant legacy of contamination throughout the facility, primarily within the heavily shielded hot cells located in several areas within the building. The high-level cell located in JN-1A and the high-energy cell (HEC) located in JN-1B contain significant residual contamination and very high radiation levels that have the potential to be up to 500 rads per hour at 1 meter. All of the cells including the alpha-gamma cells located in the basement contain radioactive contamination of appreciable magnitude. BCLDP staff members who must work in close proximity of these cells during decontamination operations require significant radiological safety overview.

INVENTORY OF RADIOACTIVE MATERIAL

The facility was licensed to possess up to 22,000,000 Curies of byproduct materials including 125 kilograms of contained U-235 plus associated and unseparated plutonium. Millions of Curies of irradiated materials moved through the cells over the nearly 30 years of research operations. Several campaigns have been conducted to remove the discrete radioactive materials and contaminated items. Examples of the types of discrete materials that have either been or will be removed include small pieces of irradiated fuel, cladding materials, and various contaminated fixtures and hardware items used in support of former research programs. The quantity of radioactive materials is comprised of these items plus building surface contamination that will be removed later.

As cleanup operations progress, the total quantity of radioactive material residing within the facility will become a firmer number. This is due to a great degree to the ability to more accurately quantify the material after it has been removed and analyzed under optimized conditions. There were two recent assessments of the radioactive material/contamination inventory performed for JN-1, one in 1998 and the other in 1999 (References 6 and 7).

DISMANTLING/ PARTIAL DECONTAMINATION OPERATIONS

Work to-date includes draining of the JN-1B fuel pool and removal of loose materials from the adjacent large cell. Equipment removal and decontamination of selected areas in JN-1A and JN-1 B has also been performed. The majority of the significant decontamination within the facility is in the planning stage. The current focus is on removal of existing radioactive materials within cells and contiguous areas. Final radioactive material removal will include the removal of contamination present on building surfaces; e.g., various concrete and steel structures.

RADIOLOGICAL SURVEY

Radiological surveys are performed on an-area by-area basis as decontamination proceeds since the entire facility is considered contaminated. Routine surveillance and maintenance (S&M) surveys are performed to locate and verify fixed radiation sources and removable contamination. The current objective is to maintain sources of radiation and smearable contamination within known and tagged areas. To demonstrate the magnitude of radioactive material present in the facility, the high levels of radioactivity found within the hot cells and storage areas comprise the majority of the radioactive material present.

AREAS CONSIDERED FREE OF CONTAMINATION

There are no areas within the building that are considered free of contamination.

KNOWN CONTAMINATION AREAS

Staff knowledge supported by historical records of routine and non-routine radiological surveillance since the facility opened support the existence of contamination throughout the building. Significant contamination areas are inside the cells and contiguous areas, including ventilation ductwork up to HEPA filters. There were several instances of the release of irradiated fuel contamination within the operating gallery for the JN-1A cells and in the operating gallery and high bay in JN-1B. The major occurrence was in the JN-1B high bay in 1980 that resulted in the release of airborne fission products on a fairly widespread basis that included contamination that reached up to the high-bay ceiling. All of the areas that were exposed to airborne contamination were cleaned up to control the spread of contamination; however, many of the overhead-structural components are in all probability contaminated in out-of-the way locations.

SUSPECT CONTAMINATION AREAS

All areas within the building, including the two adjacent storage buildings are suspect-contaminated. Sub-floor contamination is also suspect under JN-1 A. In addition, underground soil contamination is known/suspect to the east (behind) of JN-1A.

REFERENCES

1. BCL Nuclear Services, Submission of Report on Facilities for Acceptance under the DOE Surplus Facilities Management Program, August 16, 1984

2. Battelle Memorial Institute, The U.S. Government and Battelle – Partners in Nuclear Research, 1943 – Present, 1985.

3. Argonne National Laboratory, Final Report – Cursory Radiological Assessment – Battelle Columbus Laboratory Decommissioning and Decontamination Project, March 2, 1989.

4. Battelle Memorial Institute, Interim Report, on Site Characterization, West Jefferson North Site Stage 1 Sampling and Analysis – Areas 3, 4, and 6, February 27, 1990

5. Battelle Memorial Institute, Final Assessment of the Radiological Status of Battelle's Nuclear Sciences Area, May 28, 1991.

6. Myers, Louis B., Stickel, James L., and Failey, Dr.Michael B., Decontamination and Decommissioning Operations Curie Content of the Radioactive Materials in JN-1, August 1998.

7. Voth, Cidney B., Defining the Curie Content in JN-1, June 4, 1999.

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Project Number G5012-2911WJ

Internal Distribution
Project Records (2)
BMI-ES&H RP Files

Date April 25, 2000

To J. Poliziani

From G. Kirsch GEK

Subject Historical Information for Building JN-2

DESCRIPTION

Building JN-2 was constructed in 1955-1956, at the time when the West Jefferson site was first developed. The building is a two-story steel frame, concrete block and brick structure with an attached high-bay area. The usable floor space is 7,458 square feet.

PAST RADIOLOGICAL OPERATIONS

The facility was initially constructed to accommodate low wattage (one or two watts) mock-ups of prototype atomic power reactors under study. The experiments were referred to as "zero power" experiments using various combinations of core materials and arrangements. As a result of this experimental work, the building was named the Critical Assembly Laboratory (CAL). These experiments were conducted from ~ 1956 to the early 1960s. In the late 1960s a Plutonium Laboratory using only encapsulated plutonium was built for Lawrence Livermore in the space occupied by the current (and former) Radioanalytical Laboratory. During the time when this Plutonium Lab(not to be confused with the Building JN-4 Plutonium Laboratory) was in existence, an SNM dispensing and accountability lab occupied an area in the eastern end of the building contiguous to the area occupied by the former Radioanalytical Laboratory. A 1960s floor plan (Attachment I) from the SNM-7 License Application, dated December 3, 1964 illustrates the rooms associated with the Critical Assembly Laboratory. After closeout of the critical assembly experiments, all of the laboratory space on the second floor was turned into office and non-lab space. On the ground floor, the SNM Vault, associated dispensing area space and the Instrument Calibration Lab continued in operation. References associated with the various laboratories and areas are provided in Attachment II.

SUSPECT CONTAMINATION AREAS

Since it is believed that the underground water storage tank, or subsequent replacement tank, located outside on the north side of the building was used during the time of the Pu Lab and former (and current) Radioanalytical Laboratory, contamination evaluation may be needed if not already sufficiently performed. Another known-suspect area is the Radioanalytical Laboratory space and associated plumbing and ventilation systems. These systems are in use and consequently present a dynamic contamination profile. In addition, the Instrument Calibration Lab is a suspect area due to the past inventory of radioactive materials used and stored in this area.

GEK/gek
attachment

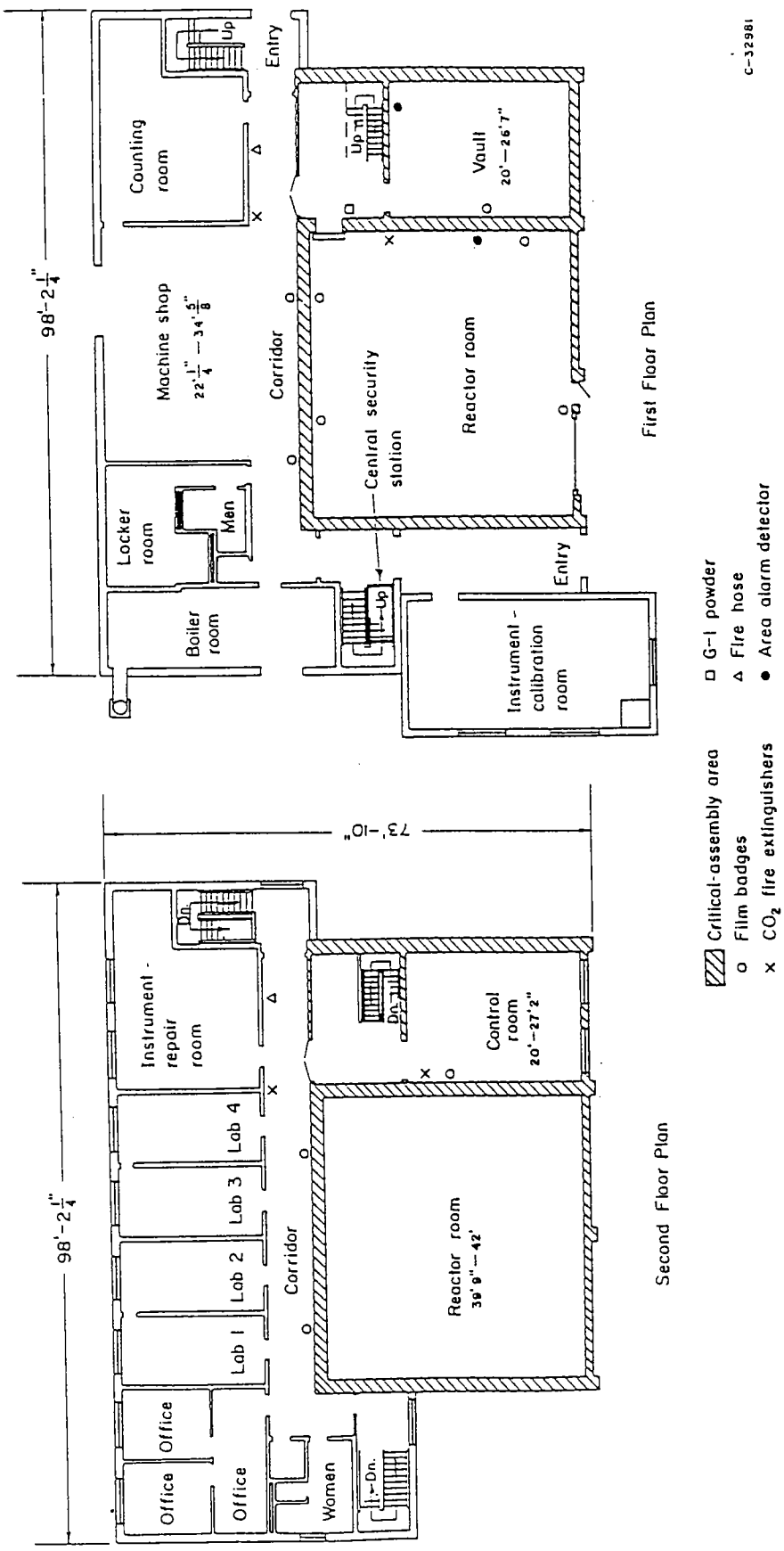

FIGURE 47. FLOOR PLAN CRITICAL ASSEMBLY LABORATORY

ATTACHMENT II

REFERENCES

Toy, Harley L., ed., Procedures and Operations for the Processing of Special Nuclear Materials at the Battelle Nuclear Facilities, Battelle Memorial Institute, April 11, 1961

Toy, Harley L., ed., Application for Renewal of Special Nuclear Materials License 7, December 3, 1964

BCL Nuclear Services, Submission of Report on Facilities for Acceptance Under the DOE Surplus Facilities Management Program, August 16, 1984

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Project Number G5012-2911WJ

Internal Distribution
Project Records (2)
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Date June 5, 2000

To J. Poliziani

From G. Kirsch GEK

Subject Historical Information for Building JN-3

DESCRIPTION

Building JN-3 was constructed in 1956 at the time when the West Jefferson site was first developed. The building is an open bay design consisting of two floors above grade with basement. Construction is steel frame, concrete block, with brick and steel exterior. An annex of similar construction is attached to the west side of the building.

PAST RADIOLOGICAL OPERATIONS

The facility was constructed to house a two-megawatt swimming pool type reactor. Experiments conducted included research in support of fuel development for the AEC. The reactor was shut down for the final time on December 31, 1974 and partially decontaminated over a nine-month period beginning in January of 1975.

DISMANTLING/ PARTIAL DECONTAMINATION OPERATIONS

Work prior to draining the pool consisted of removal of major components of the reactor cooling system, experimental facilities, and the core support structure and grid plate. After draining the pool the liner was cut and removed. All other equipment including unnecessary office furniture was removed from the building. Residual radioactivity was removed in places where unrestricted access of site personnel was required. The building was washed from top to bottom, including the ceiling of the high bay area and the area over the pool cavity. All of the ceiling trusses were vacuumed and cleaned. The high walls above the truck dock in the high bay were cleaned. In addition, the floor in the pump room and wastewater evaporator area was grit blasted to remove contamination.

RADIOLOGICAL SURVEY

Two radiological surveys were performed after the dismantling and partial decontamination operation. The dismantling team performed the first survey, referred to as a final survey. This survey was followed by a confirmatory survey by the Health Physics group. The surveys were performed to locate and verify fixed radiation sources and removable contamination. The objective was to not have smearable contamination outside the hot drain system and no direct radiation readings greater than 5mR/hr outside of tagged areas. Subsequent to the surveys, the facility received retired facility status from the NRC and the building was placed under the control of a Retired Facility Site Representative (RFSR). Usage of space within the building required approval of the RFSR. The primary building use was for the storage of waste generated from previous D&D activities. In addition, the building provided limited office and support space, including areas for site emergency-response team equipment and personnel assembly. A copy of the final survey and the confirmatory survey as provided to the U.S. Nuclear Regulatory Commission, dated September 17, 1975 is provided as Attachment I.

AREAS CONSIDERED FREE OF CONTAMINATION

On the basis of results presented in Reference 7, no subfloor contamination is present beneath the building. Additional scoping studies conducted by BCLDP Characterization staff in early 2000 substantiate these results. In addition, the large rectangular water coolant tank located underground outside the north side of the building is thought to be releasable based on past monitoring results.

KNOWN CONTAMINATION AREAS

It is known that floor contamination is prevalent. Refer to References 1, 2, and 5 for additional information. The drains, trench, and piping located around the perimeter of the bioshield are known to be contaminated. TRU, MFP, and activation products are present, either as surface contamination, or in sludge/water/soil media. Drain lines around the building are also contaminated with activation products in metal beam tubes, surrounding concrete and thermal columns. Carbon-14 is present in graphite. Most of the activated concrete in pool walls and pool floor mentioned in Reference 1 was removed after the report was written. Areas in the building that were less than 1000dpm/100 cm. square and greater than 200 dpm/100 cm. square in 1975 are described in the report.

SUSPECT CONTAMINATION AREAS

The cylindrical storage wells located in the floor of the Annex are suspected to be contaminated. Ventilation ducts located throughout the building are also suspect.

REFERENCES

1. Kok, K.D., and Basham, S.J., Dismantling of the Battelle Research Reactor, October 30, 1975.

2. Kok, K.D., Letter to U.S. Nuclear Regulatory Commission, Requesting Final Inspection, September 17, 1975.

3. BCL Nuclear Services, Submission of Report on Facilities for Acceptance under the DOE Surplus Facilities Management Program, August 16, 1984.

4. Battelle Memorial Institute, The U.S. Government and Battelle – Partners in Nuclear Research, 1943 – Present, 1985.

5. Argonne National Laboratory, Final Report – Cursory Radiological Assessment – Battelle Columbus Laboratory Decommissioning and Decontamination Project Report, March 2, 1989.

6. Battelle Memorial Institute, Radiological Characterization Plan for Selected Portions of JN-3 Bio-Shield, Subfloor Drainlines, and Fuel Storage Holes, May 15, 1991.

7. Battelle Memorial Institute, Final Assessment of the Radiological Status of Battelle's Nuclear Sciences Area, May 28, 1991.

ATTACHMENT I

Approved by S.J. Basham, W.H. Goldthwaite,
and R. Ballard (for H. Toy) before typing

117-3(587)

F.J. Milford
W.H. Goldthwaite/Chron
NFSS Files
H.L. Toy
S.J. Basham
K.D. Kok
E.O. Fromm
W.A. Carbiener
D. McKown/RSC-4
J.E. Davis/NRC Files

SEP 23 1975

September 17, 1975

Mr. Joel Kohler
U.S. Nuclear Regulatory Commission
Division of Compliance, Region III
799 Roosevelt Road
Glen Ellyn, Illinois 60137

Dear Joel:

The dismantling of the Battelle Research Reactor has been completed as described in the Dismantling Plan. We are prepared for your final inspection as soon as it can be arranged.

I have enclosed a description of the final survey as conducted by the Dismantling Team and a description of the facility as it now stands. As Jack Finn requested I have also attached a copy of the results of a confirmatory survey conducted by our Health Physics group.

If you require any further information please contact me. I am looking forward to seeing you in Columbus soon.

Very truly yours,

Kenneth D. Kok
Dismantling Team Leader

KDK:td

Enc.

Airmail

DESCRIPTION OF THE FINAL SURVEY AND FACILITY STATUS

of the

BATTELLE RESEARCH REACTOR

September 17, 1975

FINAL SURVEY

The final survey was conducted to determine if all areas of the building fell within the limits given in the Dismantling Plan. Areas such as the reactor pool, shielding pool, and pump room were surveyed with great care. The survey was made to locate fixed radiation sources and removable contamination. No smearable contamination remains outside of the hot drain system and no direct radiation readings greater than 5 mR/hr remain outside the tagged areas.

Survey Procedure

The survey included both an instrument survey to determine the location and intensity of fixed radiation sources and a smear survey to determine the level of removable contamination. In areas of probable contamination and fixed sources the instrument survey covered 100 percent of the area and multiple smears of 100 cm^2 in area were made. In areas where contamination and fixed sources were not expected a random instrument survey was made and random smears of much greater than 100 cm^2 were made.

The instrument used for the direct survey was a GM Survey Meter. A jig was made to hold the detector head 1 cm above the surface of interest. The window was kept open so both beta and gamma radiation would be detected. The instruments were calibrated at least once a week by the Instrument Laboratory.

The smears were taken using 4.25-cm-diam filter paper. They were counted on the BRR counting equipment. An end window G-M tube was used for beta-gamma radiati and a gas flow proportional counter was used for alpha radiation. These instruments a also checked weekly by the Instrument Laboratory.

If contaminated areas were found they were cleaned and resmeared. If high radiation levels were found the source was located and removed.

Specific Survey Results

All detailed smear survey results and instrument survey results are kept in the Dismantling Logs. No areas to which access is unrestricted have direct radiation levels greater than 5 mR/hr or contamination levels greater than 1000 dpm/100 cm^2. The maximum surface radiation levels is less than 0.4 mR/hr.

Reactor Pool

The instrument survey of the reactor pool covered the entire surface outside the permanent barrier in the pool stall. Two smears were made in every square meter of area. Temporary shielding was used to allow the instrument survey of the walls since the radiation from the stall area increased the background when a direct line of sight occurred. All results were within limits. The pool smears included the inside of the thermal column but not the beam tubes since they are sealed at both ends.

Shielding Pool

The shielding pool was surveyed 100 percent by instrument. Two smears were were taken in each square meter. One piece of floor was removed to examine the area beneath the floor since a hole was found in the floor at that point. Some contamination was found at the hole but it had not spread. After cleaning, this area was also found to be clean. Some direct radiation readings greater than 0.4 mR/hr but less than 5 mR/hr are present in the area of the thermal column opening into the pool; however, the entire pool is clean and all but the area mentioned is below limits.

Pump Room

Essentially two surveys were conducted in the pump room. The first followed removal of the original sump and the second followed the cleaning of the floor, motor pads, and lower side walls. Following removal of the surface concrete

the sump was smeared and surveyed and found to be below limits. This was confirmed by an independent survey conducted by Health Physics Services. The new sump was then installed. Since the floor and areas adjacent to it were contaminated these were surveyed totally by instrument after cleaning. The remainder of the walls and ceiling were spot checked. Smears were taken randomly. The entire area was found to be within limits.

Main Building, Shop, and Office Areas

These areas were all smeared and surveyed on a random basis. No significant contamination had been found in most of these areas during the lifetime of the facility. A typical office had at least six smears taken, one on each wall, floor, and ceiling. These were much greater than 100 cm^2. No activity or contamination was found.

Confirmatory Survey

In order to confirm the results of the surveys done by the dismantling team the health physics group was asked to perform an independent survey. The results of this survey are attached as Appendix 1.

DESCRIPTION OF THE DISMANTLED FACILITY

Building JN-3 is the location of the former Battelle Research Reactor. The exterior remained in the same condition as it was during reactor operation. The reactor cooling tower, except the concrete basin, has been removed. All unnecessary equipment has been removed from the interior. Only a necessary minimum of office equipment remains. All reactor instrumentation has been removed. The new water monitor and the readouts from the background Constant Air Monitor (CAM) are the only operating instruments. The shop area is completely cleared. All machinery, shelves, benches, and cabinets have been removed. Also, all reactor related hardware is gone.

Residual Radioactivity

Two types of radiation sources remain. These are components activated by direct neutron interaction during operation of the reactor and areas contaminated by radioactive material.

Activated Components

The only remaining activated components are in the stall area of the reactor pool. The primary sources are the remaining aluminum in the thermal column window, 500 mR/hr at contact, and the embedded portions of the stainless steel beam tubes, 1-2 R/hr at contact. The primary isotopes involved are Zn-65, 244 day half-life; Fe-55, 2.7 year half-life; Mn-54, 313 day half-life; and Ni-63, 92 year half-life. Since Zn-65 and Mn-54 emit gammas they provide the primary penetrating radiation source requiring shielding.

Permanent shielding was installed around the thermal column window and in the beam tube openings to bring the maximum radiation readings to less than 100 mR/hr at contact. A permanent steel mesh barrier was installed in the pool stall to prevent inadvertent access to the radiation area which remained. All other accesses to this area are also sealed. These include the vertical thermal column access, the horizontal thermal column accesses, and the six beam tubes. All these possible access points are tagged with permanent radiation area signs.

A gate has been placed in the barrier to allow access for surveys, required by the Technical Specifications. Access through the gate will be controlled by the Retired Facility Site Representative (RFSR). The barrier will be inspected as required in the Technical Specifications.

Contaminated Areas

The only area which remains contaminated above the levels required in the dismantling plan is the hot drain system. This system consists of the seven floor drains around the reactor pool on the third floor of the building and all the drains in the basement of the building including the trench around the reactor pool. These drains all lead to the rebuilt pump room sump. All water leaving the pump room sump is pumped through the water monitor, in order to assure that 10CFR Part 20 limits are not exceeded. This system will be monitored and operated under a set of procedures instituted by the RFSR.

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APPENDIX I

Date September 22, 1975

To K. D. Kok

From G. E. Kirsch

Subject Radiation Contamination-Audit Survey of Battelle Research Reactor

On September 17, 1975, D. A. McKown and G. E. Kirsch completed the radiation-contamination-audit survey of the Battelle Research Reactor as requested by the BRR Subcommittee.

The survey consisted of the collection of 320 smear swipes and over 400 radiation monitoring surveys. Areas that were smeared and monitored included walls, ceilings, floors and fixed fixtures. The parameters for the survey were 1000 dpm/100 cm^2 for transferrable beta-gamma contamination and 0.4 mr/hr for fixed beta-gamma contamination. The radiation readings were taken at a distance of 1 cm with a Nuclear-Chicago Model 2612, survey instrument equipped with a side window detector tube.

Several areas were found to be in excess of the 1000 dpm/100 cm^2 removable contamination limit during the survey and were decontaminated. The attached smear data shows survey areas less than 1000 dpm/100 cm^2 but above 200 dpm/100 cm^2.

Also included for your information are copies of the floor plans showing survey locations, smear counting results and the basement floor plan showing radiation surveys of areas from 0.2 - 1.0 mr/hr.

GEK/db

REMOVABLE BETA-GAMMA CONTAMINATION >200 DPM/100 CM^2

	Location	Removable dpm/100 cm^2
9	Basement, pump room floor SW	218
10	Basement, pump room ceiling W	243
21	Basement, evap. area bench top NE	278
25	Basement, evap. area middle floor	219
28	Basement, evap. area bench top NW	258
84	Basement, mech. room floor by door	209
124	Ground floor, shielding tank wall W.	450
131	Ground floor, shielding tank floor NW	378
188	Ground floor, front entrance floor by door	215
201	Second floor, control room window frame N.	487
205	Second floor, lab, west hood interior	500
239	Second floor, hot storage room shelves NE	683
240	Second floor, hot storage room shelves E.	276
244	Second floor, pool wall SW	437
---	Second floor, west bridge instrument plate	941
---	Second floor, east bridge south floor	509
---	Main pool, middle drain pipe N. wall	393
---	Main pool, drain pipe middle of floor	873

FIXED BETA-GAMMA CONTAMINATION >0.4 MR/HR

Location	mr/hr
Basement, pump room plugged drain west floor	0.75
Basement, evap. area sink trap N. wall	1.0
Main pool, N. wall E. pipe	0.8
Main pool, N. wall middle pipe	0.6
Main pool, N. wall W. pipe	<1.0
Main pool, wall between pools, drain pipe	<1.0
Main pool, wall between pools, 8 ft. up N. side	0.4
Main pool, wall between pools, 8 ft. up S. side	0.6

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Columbus Laboratories

Project Number 117-3 (587)

Internal Distribution

~~E. J. Milford~~
W. A. Carbiener
S. J. Basham
K. D. Kok
Files (BRR)
Files

Date April 14, 1975

To W. H. Goldthwaite

From K. D. Kok

Subject BRR Dismantling Progress

During the week of April 7 the last shipment of BRR fuel was made. The grid plate and lead thermal column shield were also shipped for burial. The pool has been drained down to 9 feet above floor level, and a great deal of progress was made in the removal of the thermal column graphite.

During this week the draining of the pool and the thermal column graphite removal should be completed. Completion of these two operations will complete the work originally scheduled for April. A shipment of low level waste items is scheduled for April 15. Preparations for cutting the pool liner and associated in pool components will also be made. Procedures for the linear shaped charge cutting operation should be complete.

KDK:lk

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Project Number G5012-2909WJ

Internal Distribution
A. Chance
Project Records (2)
BMI-ES&H RP Files

Date August 30, 2000

To J. Poliziani

From G. Kirsch GeK

Subject Historical Information for External Areas at the West Jeff North Site and Adjacent Filter Beds

Site Description/Past Radiological Operations

The retired Nuclear Sciences Area located at the West Jefferson North site comprises an area of ~10 acres. The area contains four principal buildings: JN-1, JN-2, JN-3, and JN-4 (including several outbuildings), a guardhouse, and two other small structures. The four buildings were constructed in the mid to late 1950s with the express purpose to advance the emerging technology associated with the development of atomic energy. Buildings JN-1, JN-2, and JN-3 are part of the current BCLDP D&D program. Building JN-4 was decontaminated and decommissioned in the 1978-1982 period under an earlier DOE funded program. Only the soil and underground lines around the building are addressed in this report. Operations conducted in each of the buildings are briefly described. The several filter beds used over time to treat north site sanitary effluent are also discussed. In addition, information regarding underground drain lines, piping systems, and other subterranean services is provided. Meetings, interviews, and telephone conversations were held with current, former, and retired staff members familiar with the site dating back to the 1950s. Various health, safety, maintenance, and research staff members having knowledge of the site and/or buildings were interviewed. Interviewees included Max Berchtold for JN-1 and external grounds, Larry Stickel for JN-1, JN-2, JN-3, JN-4 and external grounds, Eddie Swindall for JN-1, JN-2, JN-4 and external areas, Harley Toy for site management and NRC licensing, and Larry Lowry for research programs conducted in JN-1 and JN-3. In addition, Jack Fuess, Carl Snyder, Ron Snyder, and Jack Wiley, all long-term staff members of the Facilities, Engineering and Construction group were interviewed.

With regard to the presence of any underground radioactive contamination on the site, it is important to note that although federal regulations allowed onsite burials of radioactive materials by licensees at one time, this practice was never permitted on Battelle property. Personal knowledge of over 40 years in addition to information obtained through interviews with current and former staff members support this statement. **Attachment I** provides 1996 documentation as one example regarding this policy. Any subterranean contamination detected would likely be from leakage of underground drain lines and tanks. Contamination resulting from leakage from drain systems would not be unexpected since industry construction practices relied on standard commercial products such as clay pipe sections joined together with a mastic-like material. Over a period of ~ 40 years, underground pipe of this type is very likely to leak due to a number of causes, including ground shifting, mastic-seal degradation, and root intrusion. Please note that suspect-contaminated ground areas associated with underground drain systems have been included for evaluation in the Revision 3 Baseline.

Refer to **Attachment II** for an illustration of the North Site-Nuclear Sciences Area. A brief historical review of buildings JN-1, JN-2, JN-3, and JN-4 immediately follows. The review of

buildings is followed by comments regarding the external areas outside the buildings, and lastly, comments are provided for site areas considered free-of contamination, known to-be contaminated, and suspect-contaminated. Please note that the respective lists of areas classified as free-of contamination, known-to-be contaminated, and suspect-contaminated are not meant to be all-inclusive. Site contamination status is a changing process as characterization proceeds. Documentation regarding current site contamination status is located in the Characterization group (J. Poliziani) files.

Buildings Review

JN-1, Hot Cell Laboratory

The original building, constructed in 1955, was enlarged in two phases during the 1960s and 1970s. The facility was involved with the destructive and non-destructive examination of irradiated reactor fuel, cladding materials, and associated reactor components. Experimental programs included research in support of fuel development for the AEC, its' successor agencies, and the commercial nuclear power industry. High levels of high-specific-activity radioactive materials, including spent nuclear fuel with associated fission and activation products, and significant amounts of cobalt-60 were utilized in research operations. These materials left a significant legacy of contamination within the building contributing to the need for a thorough review of contiguous ground areas and underground drainage systems.

JN-2, Administrative Building

Formerly known as the Critical Assembly Laboratory (CAL), the building was originally used for criticality experiments from 1957 through 1963. Since the cessation of criticality experiments, the building has been used for several nuclear-related projects, including direct conversion concepts, irradiation experiment assembly, and special nuclear materials storage and dispensing. A small plutonium laboratory (decommissioned in the 1970s)) was located in the area currently occupied by a radioanalytical laboratory (RAL). The radiation instrument service facility is also housed within the building. Over time, uranium, plutonium, activation products, and fission products in various forms were present and/or used in the building. Currently, only tracer levels of radioactive materials are present in the RAL. The instrument service facility contains various calibration sources, including Co-60, Cs-137, and Pu-Be in storage for subsequent waste managing. A wastewater storage tank is located outside the north side of the building. It is estimated that the tank has been used to store radioanalytical lab wastewater for over 20 years.

JN-3, Retired Battelle Research Reactor (BRR)

The Battelle Research Reactor housed a 2-megawatt-swimming-pool-design reactor that operated from 1956 through 1974. The building was partially decontaminated after shutdown. Removal of fuel, major operating components and fixtures and selected decontamination occurred in 1975. Removal of remaining-contaminated building components and storage of waste awaiting shipment for burial is the current principal use of the building. Remaining contamination consists primarily of fission products, activation products, including carbon-14.

JN-4, Former Plutonium Laboratory

Building JN-4 was built in 1960, with additions constructed in 1964, and 1967. Plutonium operations were terminated in 1978 and decontamination and decommissioning was basically completed in 1982. The original plutonium laboratory, a corrugated metal building was removed as part of the decontamination program. The building additions remain and currently house a hazardous materials research facility. Soil areas, former storage tank locations, and underground pipe around the building are addressed in reference no. 3. Any suspect contamination would be Pu-238 and Pu-239.

External Areas Discussion

Underground Drain Lines and Other Subterranean Services

There are various underground potable water, fire protection water, sanitary water, gas, and fuel lines, including electrical services traversing the site. In addition, there is a Shell Oil Co. gasoline transmission line that crosses the site. Certain drain lines, are considered suspect-contaminated due to past operations conducted in JN-1, JN-2, JN-3, and JN-4. Soil sampling, removal of contaminated lines, and excavating in general must be performed cautiously in order to avoid damage to the various underground systems. Refer to **Attachment III** for an example illustration of the various services that are located underground. Complete documentation of all underground services is located in the Characterization group (J. Poliziani) files.

Filter Beds

The filter bed area is located between the north site and Darby Creek to the east. The area also contains the sewage treatment system for the JM middle site that operates independently from the north site beds. There have been a total of three filter beds used to process sewage water generated from the north site. There are two abandoned beds in addition to a third bed that is currently in use. The first abandoned bed was in use from ~1955 at the time when the first building, JN-1, was constructed. Use of this bed was terminated in 1958. The second bed came on stream in 1958 and was operated until 1979. The third bed has been in use since 1979. Any radioactive material contamination identified in the beds and associated septic/treatment tanks is related to North Site Nuclear Area operations. The middle (JM) site released sanitary water to north site beds at one time prior to the construction of the dedicated treatment systems for the middle area. Any radioactive-tracer materials used at the middle site are not considered to be contributors to the contamination inventory of any of the beds associated with the BCLDP remediation. Refer to **Attachment IV** for an illustration of the filter bed area. Complete documentation of the filter bed area is located in the Characterization group (J. Poliziani) files.

Areas Considered Free of Contamination

There are site-soil areas that have been characterized and are considered to be free of contamination. Characterization is on-going process and statusing of areas is a dynamic process. Presently, due to the numerous documents that are associated with areas that are considered free-of contamination, the documents are not included with this report. The documents are available for review in the Characterization group (J. Poliziani) files.

Known Contaminated Areas

Staff knowledge supported by historical records, routine and non-routine radiological surveillance, and soil characterization surveys support the existence of contamination in the following locations around the buildings.

External to JN-1

-Lawn area immediately in-front of the building, including portions of the paved area between JN-1 and JN-2.
-Paved area behind JN-1 including soil immediately adjacent on all sides due to runoff of contamination over the years.
-Underground drainage pipes exiting the building.
-Underground waste water tank at southeast corner of the building

External to JN-2

-There are no known contaminated ground areas immediately external to JN-2 except as described to the front (west) of JN-1 or external to JN-3 and JN-4.

External to JN-3

-Sump in front of the building on the east side, including underground drain lines proceeding in a southeast direction to the filter bed area. Complete documentation of the filter bed area is located in the Characterization group (J. Poliziani) files.

External to JN-4

-Any drain lines from the former plutonium lab operations that proceed southeast to the filter bed area.

Filter Beds East of Buildings

- Filter bed area east of buildings. Refer to **Attachment IV** for an illustration of the beds, associated drain lines, and septic tanks.

Note: There are site-soil areas that have been characterized and considered to be contaminated. Characterization is on going and statusing of areas is a dynamic process. Presently, due to the numerous documents that are associated with known-contaminated areas, the documents are not included with this report. The documents are available for review in the Characterization group (J. Poliziani) files.

Suspect-Contaminated Areas

External to JN-1

-Lawn immediately in-front of the building, including portions of the paved area between JN-1 and JN-2.
-Pavement contamination from wash off from parked trucks that delivered irradiated fuel shipments to JN-1.
-Paved area behind JN-1 including soil immediately adjacent on all sides due to runoff of contamination over the years.
-All underground drainage pipes exiting the building.

-Underground wastewater tank at northeast corner of the building.
-Sub-floor contamination is also suspect under the JN-1A section of the building, including under the machine shop northeast corner.
-Underground soil contamination is known/suspect to the east (behind) the building.

External to JN-2
-The underground waste tank area north of the building outside the Radioanalytical Laboratory. In the past there have been small spills of slightly contaminated water in the proximity of the RAL underground tank during tank emptying operations. Concentrations of radioactivity in the spilled water did not require soil remediation.

External to JN-3
-None other than the areas described under known areas for this building.

External to JN-4
The external drain lines and areas where underground storage tanks associated with the former plutonium lab were located.

Note: There are site-soil areas that are considered to be suspect-contaminated. Characterization is on going and statusing of areas is a dynamic process. Presently, due to the numerous documents that are associated with suspect-contaminated areas, the documents are not included with this report. The documents are maintained and available for review in the Characterization group (J. Poliziani) files

References

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5. Battelle Memorial Institute, Interim Report, on Site Characterization, West Jefferson North Site Stage 1 Sampling and Analysis – Areas 3, 4, and 6, February 27, 1990

6. Battelle Memorial Institute, Final Assessment of the Radiological Status of Battelle's Nuclear Sciences Area, May 28, 1991.

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8. Voth, Cidney B., Defining the Curie Content in JN-1, June 4, 1999.

9. Battelle Memorial Institute, BCLDP Site Environmental Report for Calendar Year 1999 on Radiological and Nonradiological Parameters, August 15, 2000.

GEK/GEK

HistoryWJnorthextareas

ATTACHMENT I

Project Number RP 3.4, RP 9.1

Battelle
. . . Putting Technology To Work

Internal Distribution

S Layendecker
C Jensen
G Kirsch
BMI ES&H Files
Project Records (2)

Date October 29, 1996

To Craig Jensen

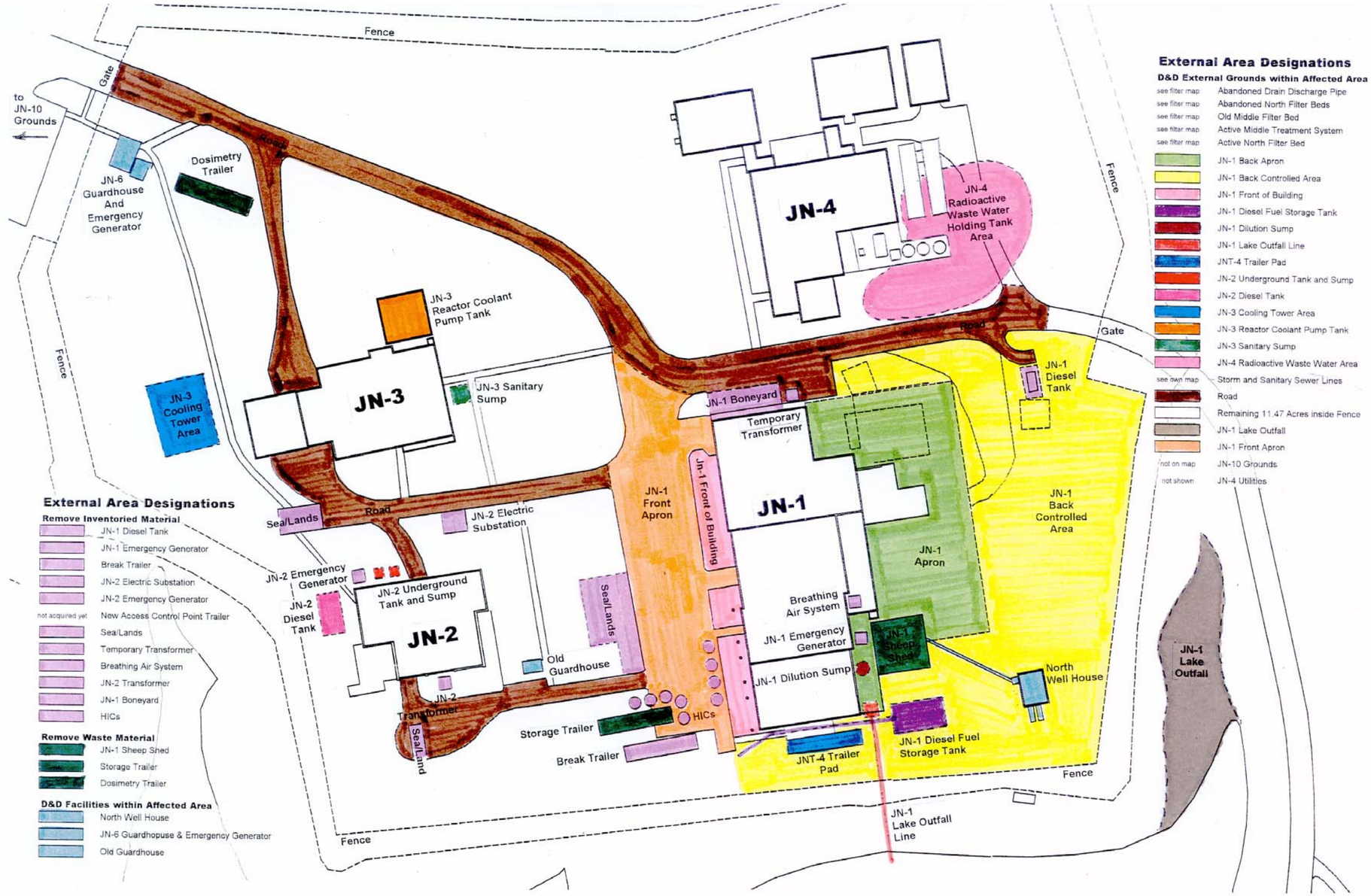
From George Kirsch GK

Subject Prohibition of Onsite Burial of Radioactive Materials

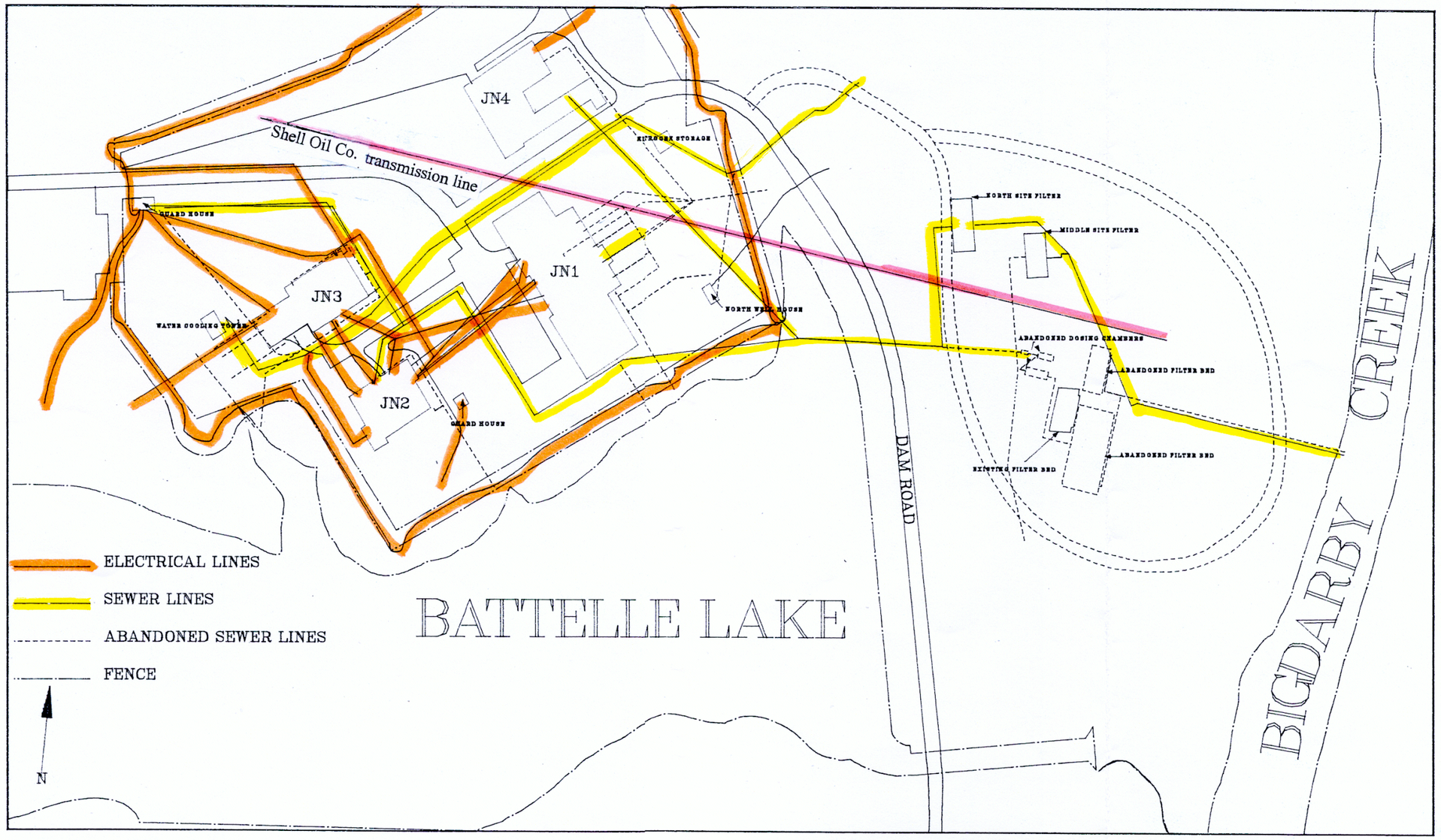
It has always been Battelle policy to prohibit the onsite burial of radioactive materials in any form. During my 37 years at Battelle, all of which were associated with the handling and monitoring of radioactive material use at both the King Avenue and West Jefferson sites, I am not aware of any instances of onsite burials.

This policy can be confirmed through interviews with early Radiological Safety Committee members and nuclear operations personnel.

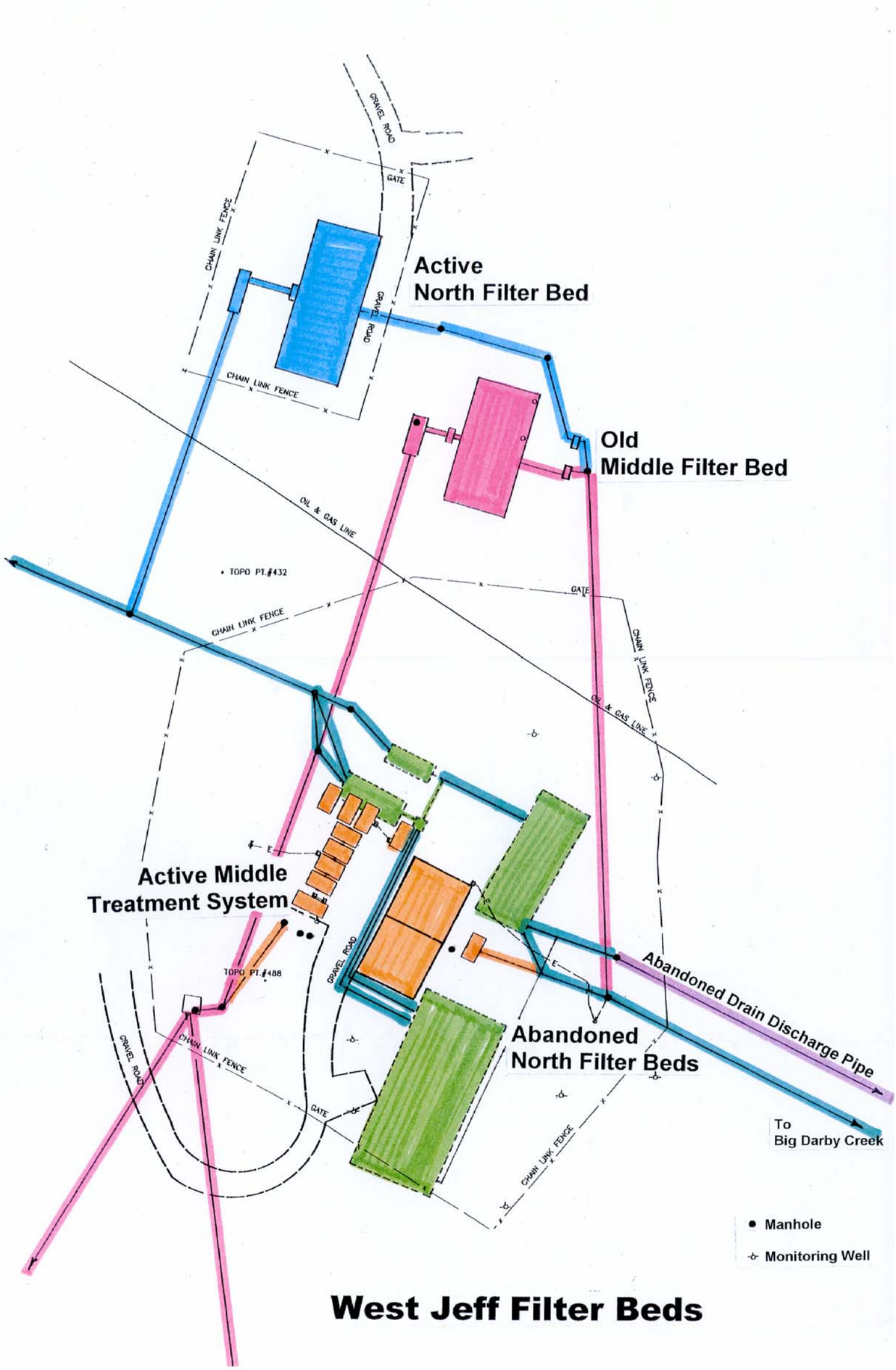
ATTACHMENT II


Fence
Gate
to JN-10 Grounds
Road
Dosimetry Trailer
JN-6 Guardhouse And Emergency Generator
Fence
JN-4
JN-4 Radioactive Waste Water Holding Tank Area
Fence
Gate
Road
JN-3 Reactor Coolant Pump Tank
JN-3
JN-3 Sanitary Sump
JN-3 Cooling Tower Area
JN-1 Boneyard
Temporary Transformer
JN-1 Diesel Tank
Jn-1 Front of Building
JN-1
JN-1 Front Apron
JN-1 Back Controlled Area
JN-1 Apron
Sea/Lands
Road
JN-2 Electric Substation
JN-2 Emergency Generator
JN-2 Diesel Tank
JN-2 Underground Tank and Sump
JN-2
Sea/Lands
Old Guardhouse
JN-2 Transformer
Sea/Land
Storage Trailer
HICs
Break Trailer
Breathing Air System
JN-1 Emergency Generator
JN-1 Dilution Sump
JN-1 Sheep Shed
North Well House
JN-1 Lake Outfall
JNT-4 Trailer Pad
JN-1 Diesel Fuel Storage Tank
Fence
JN-1 Lake Outfall Line
Fence
External Area Designations
D&D External Grounds within Affected Area
see filter map Abandoned Drain Discharge Pipe
see filter map Abandoned North Filter Beds
see filter map Old Middle Filter Bed
see filter map Active Middle Treatment System
see filter map Active North Filter Bed
JN-1 Back Apron
JN-1 Back Controlled Area
JN-1 Front of Building
JN-1 Diesel Fuel Storage Tank
JN-1 Dilution Sump
JN-1 Lake Outfall Line
JNT-4 Trailer Pad
JN-2 Underground Tank and Sump
JN-2 Diesel Tank
JN-3 Cooling Tower Area
JN-3 Reactor Coolant Pump Tank
JN-3 Sanitary Sump
JN-4 Radioactive Waste Water Area
see own map Storm and Sanitary Sewer Lines
Road
Remaining 11.47 Acres inside Fence
JN-1 Lake Outfall
JN-1 Front Apron
not on map JN-10 Grounds
not shown JN-4 Utilities
External Area Designations
Remove Inventoried Material
JN-1 Diesel Tank
JN-1 Emergency Generator
Break Trailer
JN-2 Electric Substation
JN-2 Emergency Generator
not acquired yet New Access Control Point Trailer
Sea/Lands
Temporary Transformer
Breathing Air System
JN-2 Transformer
JN-1 Boneyard
HICs
Remove Waste Material
JN-1 Sheep Shed
Storage Trailer
Dosimetry Trailer
D&D Facilities within Affected Area
North Well House
JN-6 Guardhopuse & Emergency Generator
Old Guardhouse

ATTACHMENT III


JN4
Shell Oil Co. transmission line
GUARD HOUSE
JN1
JN3
WATER COOLING TOWER
NORTH WELL HOUSE
JN2
GUARD HOUSE
NORTH SITE FILTER
MIDDLE SITE FILTER
ABANDONED DOSING CHAMBERS
ABANDONED FILTER BED
ABANDONED FILTER BED
EXISTING FILTER BED
DAM ROAD
CREEK
BIGDARBY
ELECTRICAL LINES
SEWER LINES
ABANDONED SEWER LINES
FENCE
N
BATTELLE LAKE

ATTACHMENT IV


Active
North Filter Bed
Old
Middle Filter Bed
Active Middle
Treatment System
Abandoned
North Filter Beds
Abandoned Drain Discharge Pipe
To
Big Darby Creek
GRAVEL ROAD
GATE
CHAIN LINK FENCE
OIL & GAS LINE
TOPO PT. #432
TOPO PT. #488
Manhole
Monitoring Well
West Jeff Filter Beds